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given; but with reference to the $0^m.7$ residual for (133) *Cyrene* it may be said that the tables for that planet could not have been expected to hold as accurately as the others, because its mean motion is roughly commensurable with that of *Jupiter*, in which case HANSEN's method is more or less indeterminate. Whether the residual is due to this cause or to neglected perturbations or to the inclusion in the final correction of the elements of a position erroneously identified by the observer, will form the subject of further investigation.

Thus several years after the last comparisons were made, the theoretical positions based upon LEUSCHNER's tables are found to check almost exactly with the observations. The correction to the 1915 *Jahrbuch* ephemeris for (139) *Juewa*, noted in No. 4625 of the *Astronomische Nachrichten*, is not confirmed by the preceding comparisons.

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UNIVERSITY OF CALIFORNIA,
1913, April.

THE DAVIDSON TRANSIT AND ZENITH TELESCOPE

BY OSCAR W. LANZENDORF.

When the Students' Observatory was organized more than twenty years ago, a Davidson transit and zenith telescope simliar to the kind then in use in Coast Survey work was installed. It is equipped with a 3-inch object glass, latitude circle, striding level, and a micrometer which can be used in right ascension or declination. It is used mainly to determine time, latitude, and longitude.

During its twenty years' service it has been constantly used by students. Due to the more or less rough usage it has thus received, and to general wear, the instrument no longer gave consistent results. These anomalies were investigated by Messrs. P. W. STONER and H. J. KESNER in 1910-11, and as a result the instrument was sent back to the makers in 1911 to be remodeled. Upon its reinstallation at the observatory it was necessary again to determine its constants, which may have been changed as the result of remodeling.

In this work all of the constants were determined, but only the pivots and the micrometer are discussed here.

The inequality and ellipticity of the pivots were determined by the ordinary method of applying the spirit level to the outer surfaces of the pivots at properly chosen zenith distances. The values thus obtained were plotted upon co-ordinate paper. The curves show that the inequality, p, tends to decrease by a small amount with the zenith distance from 0° to 90° and then to increase with increasing zenith distances from 90° to 135°. This variation is probably due to ellipticity of the pivots, but the curves obtained for this ellipticity do not disclose any particular variation. The inability to show any decided variation of this kind can be said to be due to the method of observation with which the values were obtained; the instrument must be reversed by hand, which process tends to jar the different parts and so produce large unavoidable errors of observation. Since the ellipticity is of the order of these large errors of observation, it is not brought out. It is possible that when the new automatic reversing apparatus is installed, which reverses the instrument without jarring it, the ellipticity can be determined.

An average value of the inequality of the pivots was therefore adopted: $p = 0^s.047 \pm {}^s.001$; being the mean of thirty-four determinations.

The micrometer screw was investigated in detail, using the circumpolar star method, the value of one revolution being determined for each part of the screw. It was found to have a decided variation between $R = 59''.8$ and $60''.0$; about $0''.2$ per revolution over a range of forty revolutions. A curve was plotted with values of one revolution as ordinates and number of revolutions as abscissæ, showing the variation for the length of the screw. The curve has a typical symmetrical wave-form, two waves in length, having a wave-length of thirteen revolutions and an amplitude of about $0''.1$. This curve was obtained from calculations based on six sets of determinations, comprising 328 observations on circumpolar stars.

Since the success of Talcott's method of determining the latitude depends upon the accuracy of one revolution of the micrometer, tables were constructed with the aid of mechanical quadratures which give the micrometer interval directly without reference to the plotted curve.

Several determinations of the latitude of the Students' Observatory have been made in the past, wherein the results by certain pairs of stars do not agree well with those from other star pairs. This disagreement will be investigated upon the basis of the now well-determined variation in the value of one revolution of the micrometer, and it is expected that the results from different pairs will then be found consistent.

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1913, April.